belief that the power to affect the protoplasm so as to lead it to produce structures useful to the gall-makers has been acquired independently by numerous organisms (plants as well as animals), in widely different grades of development. If that is so, it seems reasonable to expect that power to control the activity of protoplasm will, at least to some extent, be acquired by man, and may produce results of great value. Although as yet experiments have thrown little light on the artificial production of galls, there is a very attractive field open for research in this direction.

Since 1870 an extensive literature has appeared dealing with galls, dispersed so widely that much of it was almost beyond reach of even keen students in this field. In 1858 G. von Haimhoffen estimated the known galls of Europe at from 300 to 350. In Kaltenbach's "Planzenfeinde," issued in 1873 and 1874, the galls of Central Europe formed by insects, and by a few mites, were described under the host-plants; and from 1890 to 1895 D. von Schlechtendal issued a catalogue of the galls of animal-origin then known to occur in Germany.

In 1901 appeared two works giving brief descriptions of the galls of Europe and of the Mediterranean area, Kieffer's "Synopsis des Zoocécidies d'Europe," and Darboux and Houard's "Catalogue systématique des Zoocécidies de l'Europe et du Bassin Méditerranéen." These were most welcome, and stimulated research so greatly that a new catalogue had already become necessary when M. Houard supplied the need by his latest work, "Les Zoocécidies des Plantes d'Europe et du Bassin de la Méditerranée." Based upon the "Catalogue," and covering the same area, comparison of the two shows remarkable progress during the few years that elapsed between their dates of issue. Such a comparison is a little hindered by the host-plants being arranged in the earlier list in alphabetical order of the generic and specific names, while in the later they are in families, these following the order in Engler's "Pflanzenfamilien," while within each family the genera and species are grouped after Nyman's "Conspectus Floræ Europeæ." The advantages derived from the re-arrangement of the host plants beside their allies far outweigh those of the alphabetical arrangement.

The comparison between the individual hosts in the two lists shows very careful revision of the descriptions common to both, the omission from the second of some forms included in the first, the definite reference to their makers of numerous galls previously of unknown or doubtful origin, and the addition of many recently discovered galls, some on plants already known to bear galls, others on new hosts. A rough indication of the advance is given in the rise of the marginal numbers attached to the galls from 4169 to 6239; but perhaps a truer value is afforded by the increase of the host-plants in much the same proportion, and of the known gall-makers from 1072 to 1366 species, the increase being especially large among the Curculionidæ (beetles), the Cynipidæ (gall-flies), the Cecidomyidæ (gall-midges), and Eriophyidæ (gall-mites). Numerous additions have been made to the very useful illustrations scattered through the book.

An important addition is a bibliography of the literature on galls, which, though not complete, is the best that has yet been published, and will be found most helpful as a guide, while its value is increased by references to it under each gall; and the countries in which the galls have been found are also indicated very briefly, yet simply. Under each host-plant the galls are arranged on the same method as was employed in the "Catalogue systématique," viz., terminal galls of fruits, flowers, stems, and buds, followed by lateral growths on roots, stems, branches, leaves, &c. In most cases this method makes it possible to ascertain the name of any gall without serious difficulty; but on some of the oaks and a few other plants the forms are so numerous as to lead to further subdivision of the groups by subordinate characters.

The arrangement of the plants in families has allowed a brief but suggestive outline of the leading features of the galls characteristic of each family, and of occasional suggestions for inquiries.

Careful indexes of the host-plants and of the gall-makers add greatly to the usefulness of the book, and the typography is excellent. It is, in a very literal sense, indispensable to all students of galls, while those interested in the problems as to the nature of living matter and its responses to stimuli will find in its pages much matter for further investigations.

ELECTRICITY ON THE FARM.

Électricité agricole. By A. Petit. Pp. 424. (Paris: J. B. Baillière et Fils, 1909.) Price 5 francs.

THIS book is one of the sixty volumes of the "Encyclopédie agricole," published under the editorship of M. Wery, the scope of which is well summed up in the introduction:—

> "Extraire de notre enseignement supérieur la partie immédiatement utilisable par l'exploitant du domaine rurale et faire connaître du même coup à celui-ci les données scientifiques définitivement acquises sur lesquelles la pratique actuelle est basée."

It is in no sense a popular exposition of the principles of electricity, but is rather written for the intelligent farmer who knows something about electricity and also about engineering, and is enterprising enough to investigate the merits of a new suggestion.

The first chapter is devoted to a recapitulation of the general principles and the system of units employed. No attempt is made to dispense with technical expressions; "connaître le vocabulaire d'un art, c'est déjà connaître cet art." The modes of transforming mechanical into electrical energy are then discussed in a very interesting chapter, the sources of energy dealt with being water power, steam, oil, and wind. Of all these wind would be by far the best if electricity had to be generated on the farm itself, but the difficulties are considerable. Attempts have been made in this direction particularly by M. La Cour in Denmark, whose trials are perhaps the most complete yet made, and who has demonstrated the possibility of utilising wind if there is also some subsidiary source of power. But the subject is by no means exhausted, and the utilisation of the energy of

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the wind still remains one of the most fascinating problems in agricultural engineering. The transmission of the current is next described. In this chapter, as in the preceding one, there are a number of diagrams to illustrate the principle of the apparatus, besides a good deal of information that will be useful when anything goes wrong. These chapters take up half the book.

The author then comes to the very important subject, How can electrical energy be utilised on the farm? The two applications developed in detail are the driving of engines and lighting. Its use for driving the machinery in the farm buildings, the chaff-cutter, the pulper, and so on, is obvious, but the author goes still further and describes a number of applications which as yet have only rarely been made. Some forty pages are devoted to electrical ploughing, the first attempts at which were made so far back as 1879, although as a practicable method nothing was done until 1894, when a start was made both in Italy and in Germany. The methods are almost exactly the same as for steam ploughing; indeed, the idea is taken direct from the steam plough but electricity is substituted for steam as the hauling power. In one system there are two electric motors at opposite ends of the furrows hauling the plough; in the other an anchor is used and there is one motor only. The problem here is really very simple; if steam ploughing is known to be beneficial electric ploughing will be equally so, and the question resolves itself solely into the relative cost of the power. Indeed, this statement holds true of most of the applications recommended by the author. His electrical threshing machine, for instance, is the ordinary machine driven by electrical power, so also are the refrigerating machines, pumps, and sawmills.

The application of electricity as a source of light affords a great deal of scope for the author's ingenuity, since many of the farm operations, such as the milking and feeding of dairy cows, have to be carried out before daylight during part of the year. Suitable lamps are suggested for the various buildings.

There is also a useful chapter on treatment of accidents caused by electricity and precautions to be taken in order to avoid accidents. Lastly we have some well-illustrated descriptions of farms where some of these applications are in actual use. Probably to the English reader this is the most interesting chapter of all. Whether we may expect to see electricity utilised on British farms is another matter. Up to the present electricity has simply been taking the place of steam to work the old implements originally designed for human or horse labour. Probably before it comes into common use in agriculture our implements will have to be re-modelled and adapted to electrical power. In the cases described by the author water power is available or electric current is being transmitted through the district. The farmer can calculate exactly how much his power will cost him and whether it is worth while replacing the oil engine by a motor.

The book forms a useful contribution to agricultural engineering, and will make very suggestive reading for the thoughtful agriculturist.

THE PHENOMENA OF THE EARTH'S SURFACE.

Physiography for Schools. By R. D. Salisbury. Pp. viii + 530. (London: John Murray, 1909.) Price 6*s.* net.

THIS book may be looked on as a reduction of the advanced course by the same author. Prof. Salisbury states in his preface that he differs from other writers on physical geography "as to the points upon which emphasis should be laid and the objects to be attained." But it would require careful reading to find out in what matters of principle this text-book differs from others by American authors, and we fancy that schools will adopt one book or the other rather from some attraction between the teacher and the author than from any preference as to mode of treatment. We miss the "cycle of erosion," and its accompaniment, the "peneplain," which have taken quite an affectionate hold upon our minds; but we meet the "mesa" and the "monadnock," and the really awkward adjective "piedmont," this last being used without explanation, and applied to certain plains as well as glaciers.

Valley-forms are agreeably dealt with as expressions of youth, maturity, or old age, and the excellent chapter on the "Work of Running Water" may be taken as typical of the first part of the book. We should not like to spare any of its numerous maps and illustrations, which bring before us all manner of details in the history of a stream; at the same time, we should like to hear more from the author, whose lines are modestly dovetailed in between them. A specially effective feature of part i. is the insertion of some twenty contoured maps in colour, often on a scale of one inch to one mile, selected from the topographic sheets of the United States Geological Survey. With this example before us, must we wait long for a European work, similarly illustrated from our British contoured maps, and also, perhaps, from the 1:200,000 sheets of the Austrian Military Institute?

The later parts of the book, on "Earth Relations," "The Atmosphere," and "The Ocean," do not lend themselves so temptingly to illustration; but numerous diagrams and charts are given, and the instruction in the text is singularly clear. Fig. 351, showing how the length of a degree is related to polar flattening, requires more thought than a child is likely to bring to bear on it. Perhaps a diagram showing how longer distances have to be traversed as we go northward, in order to shift the altitude of the pole star by so many degrees, might have been simpler, in illustration of the description on the following page. Snow crystals are named "snowflakes" in the title of Fig. 176; and Fig. 450 shows the sounding-tube, and not the line, as stated. We fear that the abrupt question to the reader, "Why not use a rope, instead of a wire, in sounding?" may be taken as a suggestion from the gifted author, and may turn the young mind in a wrong direction. But there is little to criticise in this closely-written text-book. We return to the pages on the work of rivers and of ice with special pleasure. The author thinks (p. 168) that plastic flow does not play any real part in glacier motion, and lays stress

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